

**CLAIMS: I claim:**

1. A two stroke, internal combustion, reciprocating engine having a number of similar working units, each working unit comprising:
  - a) a cylinder, closed at one end by a cylinder head and containing a movable power piston which moves in a reciprocating manner and is connected to a power output shaft;
  - b) a movable wall located within said cylinder;
  - c) a means for moving said movable wall during predetermined times during the engine's operating cycle;
  - d) an air intake port;
  - e) an upper port valve;
  - f) a heater port valve;
  - g) a path from said heater port valve to said upper port valve containing a heat exchanger high pressure side;
  - h) an exhaust valve;
  - i) a path from said exhaust valve to the outside of said working unit containing a heat exchanger low pressure side;
  - j) a fuel injector;
  - k) an igniter;
2. An engine as recited in claim 1 wherein said means for moving said movable wall during predetermined times during the engine's operating cycle is a moveable wall cam follower and a cam driven from said power output shaft.
3. An engine as recited in claim 1 having one or more compressor cooling systems, said compressor cooling system comprising a displacer located within said cylinder, a lower compressor valve, an upper compressor valve, a path from said lower compressor valve to said upper compressor valve

containing a cooler, and said displacer is moved by a displacer cam follower and a groove in said cam driven from said power output shaft.

4. An engine as recited in claim 1 wherein said movable wall is constructed so that the hot and cold parts of the engine are separate.
5. A process for operating the engine of claim 1 having the following steps:
  - a) from when said power piston uncovers said air intake port and moves through its bottom dead center position and moves back up to said air intake port; air intake occurs, said movable wall moving up until the desired charge is in said cylinder, at the same time some exhaust through said heat exchanger low pressure side also occurs;
  - b) after said power piston covers said air intake port, said power piston, and said movable wall continue to move up, pushing air out of said exhaust valve through said heat exchanger low pressure side until said movable wall reaches the top of said cylinder, and said exhaust valve closes;
  - c) said power piston moves up, and compression occurs until said power piston reaches the top of its upward travel;
  - d) as said power piston starts moving down, said movable wall moves away from its position adjacent to said cylinder head toward said power piston, compressed air is forced from below said movable wall through said heat exchanger high pressure side, heats up, and moves to above said movable wall;
  - e) when said movable wall reaches the top of said power piston, fuel is injected and burned, and said movable wall, and said power piston continue the heated expansion stroke;
  - f) the cycle repeats.
6. A process for operating the engine of claim 3 having the following steps:
  - g) from when said power piston uncovers said air intake port and moves through its bottom dead center position and moves back up to said air intake port; air

intake occurs, with displacer, and said movable wall moving up until the desired charge is in said cylinder, at the same time some exhaust through said heat exchanger low pressure side also occurs;

- h) after said power piston covers said air intake port, said power piston, said displacer, and said movable wall continue to move up, pushing air out of said exhaust valve through said heat exchanger low pressure side until said movable wall reaches the top of said cylinder, and said exhaust valve closes;
  - i) said power piston moving up, and said displacer come together, pushing air through said cooler as compression occurs and said power piston reaches the top of its upward travel;
  - j) as said power piston starts moving down, said movable wall moves away from its position adjacent to said cylinder head toward said displacer, compressed air is forced from below said movable wall through said heat exchanger high pressure side, heats up, and moves to above said movable wall;
  - k) when said movable wall reaches the top of said displacer, fuel is injected and burned, and said movable wall, said displacer, and said power piston continue the heated expansion stroke;
  - l) the cycle repeats.
7. An engine cycle having the following processes:
- a) air is cooled as it is compressed;
  - b) air is heated by recovered heat from said heat exchanger at a pressure that is the same at the end of this process as it was at the beginning of this process;
  - c) air is heated by burning fuel;
  - d) air is completely expanded;
  - e) heat is recovered from the exhaust air at close to constant pressure.